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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/780,073

02/17/2004

Ji-hye Yi

5649-1217

9477

7590

09/30/2004

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EXAMINER

WILSON, SCOTT R

ART UNIT

PAPER NUMBER

2826

DATE MAILED: 09/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/780,073

Applicant(s)

YI ET AL.

Examiner

Scott R. Wilson

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-13 is/are allowed.
- 6) ☒ Claim(s) 14,16,18-28 and 30 is/are rejected.
- 7) ☒ Claim(s) 15,17,29 and 31 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>2/17/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 18-23 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The recitation "a second contact plug connected to the upper electrode and the first contact plug" is neither described in the specification, nor shown in the drawings.

Claim 26 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Neither the specification, nor the drawings, describe a configuration in which the first surface of the phase-change layer, where the first electrode is electrically connected, is opposite the substrate from the second surface of the phase-change memory layer.

Claim 30 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Neither the specification, nor the drawings, describe a configuration in which the first and second electrodes are at a same level with respect to the substrate.

Claim Rejections - 35 USC § 102

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The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claims 14 and 16 are rejected under 35 U.S.C. 102(e) as being anticipated by Horii. As to claim 14, Horii, Figure 2A, discloses a phase-change memory device comprising a phase-change memory layer (71) having a first surface, abutting layer (69), facing a semiconductor substrate (51) and a second surface, abutting layer (73), which is opposite the first surface, a plurality of conductive layers, (69), between the semiconductor substrate (51) and the phase-change memory layer (71), a plurality of contact plugs (68) connected to the first surface of the phase-change memory layer, such that the phase-change memory layer is electrically connected to ones of the plurality of conductive layer, and an insulating layer (73), which may comprise insulator silicon nitride (paragraph 0020), which covers the second surface of the phase-change memory layer.

As to claim 16, Horii discloses (paragraph 0019) that the phase-change memory layer contains chalcogen elements.

Claims 24, 25, 27 and 28 are rejected under 35 U.S.C. 102(e) as being anticipated by Fricke et al.. As to claim 24, Fricke et al., Figure 3, discloses (paragraph 0032) a phase change memory device comprising: a phase-change memory layer (23) on a semiconductor substrate, the phase-change memory layer having a major axis that is substantially parallel to a major axis of the semiconductor substrate and having a first surface and a second surface opposite the first surface that are substantially parallel to the major axis of the phase-change memory layer; a first electrode (39) on the semiconductor substrate that is electrically connected to the first surface of the phase-change memory layer in a first contact region of the phase-change memory layer; and a second electrode (33) on the semiconductor

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substrate that is electrically connected to the phase-change memory layer in a second contact region of the phase-change memory layer, the second contact region being space apart from the first contact region.

As to claim 25, Fricke et al., Figure 3, discloses that the second surface of the phase-change memory layer, embodied as the upper surface of region (23), is opposite the substrate from the first surface, embodied as the bottom surface of region (23), of the phase-change memory layer.

As to claim 27, Fricke et al., Figure 3, discloses that the first (39) and second (33) electrodes are different distances from the substrate.

As to claim 28, Fricke et al., Figure 3, discloses that the phase-change memory layer (23) is at an intermediate distance from the substrate, between the first (39) and second (33) electrodes.

Allowable Subject Matter

Claims 1-13 are allowed. No prior art discloses first and second contact surfaces on the same side facing the semiconductor substrate, of a phase-change memory layer, where the first contact surface electrically connects to a first conductive layer under the phase-change memory layer, and the second contact surface electrically connects to a second conductive layer above the phase-change memory layer.

Claim 15 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses two contact plugs connecting the same side of the phase-change memory layer to two different conductive layers.

Claim 17 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed invention with an additional metal layer covering the surface of the phase-change material layer.

Claim 29 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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No prior art discloses the claimed invention where a third electrode connects the second electrode to the phase-change memory at a fourth level from the substrate.

Claim 31 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed invention with an additional metal layer on the phase-change material layer, opposite the first and second contact regions.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott R. Wilson whose telephone number is 571-272-1925. The examiner can normally be reached on M-F 8:30 - 4:30 Eastern.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


NATHAN FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

srw
September 23, 2004